$\int_0^x e^{-t^2}\,dt = F(x) - F(0)$

$F(x)$ is an antiderivative of e^{-x^2}

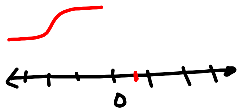
$F(x) = e^{-x^2}$

$F'(x) = -2xe^{-x^2}$

$F(x) = \frac{e^{-x^2}}{-2x}$

$F'(x) =$ Quotient Rule

$\int_0^x e^{-t^2}\,dt = 0.6$



$x = \frac{p}{q}$ p, q integers $q \neq 0$

$x = \sqrt{2} \approx 1.414\cdots$

Nov 8-9:16 AM

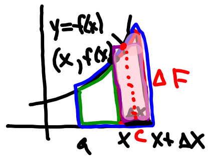
5.4b Fundamental Theorem of Calculus

proof of ftc

$\frac{d}{dx}\left(F(x) - F(a)\right) = f(x) - 0$

I $\frac{d}{dx}\int_a^x f(t)\,dt = f(x)$

II $\int_a^b f(x)\,dx = F(b) - F(a)$; $F'(x) = f(x)$



$F(x) = \int_a^x f(t)\,dt$

$\frac{\Delta F}{\Delta x} = \frac{F(x+\Delta x) - F(x)}{\Delta x}$

$\lim_{\Delta x \to 0} \frac{\Delta F}{\Delta x} \stackrel{?}{=} f(x)$

$\lim_{\substack{\Delta x \to 0 \\ c \to x}} \frac{F(x+\Delta x) - F(x)}{\Delta x} = \frac{f(c)\cdot\cancel{\Delta x}}{\cancel{\Delta x}}$

$F'(x) = f(x)$

Nov 13-5:36 PM

1.1 1.2 1.3 *Unsaved

$\frac{d}{dx}\left(\int_{-\pi}^{x} (\cos(t))\,dt\right) = \cos x$

$\frac{d}{dx}\left(\int_{0}^{x} \left(\frac{1}{1+t^2}\right)dt\right) = \frac{1}{1+x^2}$

Nov 13-5:38 PM

1.2 1.3 1.4 *Unsaved

$\frac{d}{dx}\left(\int_{1}^{x^2} (\cos(t))\,dt\right) = \cos(x^2)\cdot 2x$

$\frac{d}{dx} F(x^2) = F'(x^2)\cdot 2x$

Nov 13-5:45 PM

1.3 1.4 1.5 *Unsaved

Find dy/dx

$\int_a^b = -\int_b^a$

$$y=\int_x^5 (3t\sin(t))\,dt = -\int_5^x 3t\sin t\,dt$$

$$y' = ?\ -3x\sin x$$

$$y=\int_{2x}^{x^2}\left(\frac{1}{2+e^t}\right)dt \quad y' = \frac{2x}{e^{x^2}+2} - \frac{2}{e^{2x}+2}$$

$$y = F(x^2)-F(2x) \quad y' = 2x\,F'(x^2) - 2F'(2x)$$

$$F'(x) = \frac{1}{2+e^x} \qquad 2x\cdot\frac{1}{2+e^{x^2}} - 2\,\frac{1}{2+e^{2x}}$$

Nov 13-5:47 PM

Find a function $y = f(x)$ with derivative $dy/dx = \tan(x)$ that satisfies the condition $f(1)=2$. Graph the function.

$x=1\ \ y=2$ y is the antiderivative of $\tan x$

$$y=\int_a^x \tan(t)\,dt \qquad \frac{dy}{dx} = \tan x$$

$$2 = \int_1^1 \tan t\,dt + 2$$

$$y = \int_1^x \tan t\,dt + 2$$

Nov 13-5:57 PM